OVERVIEW

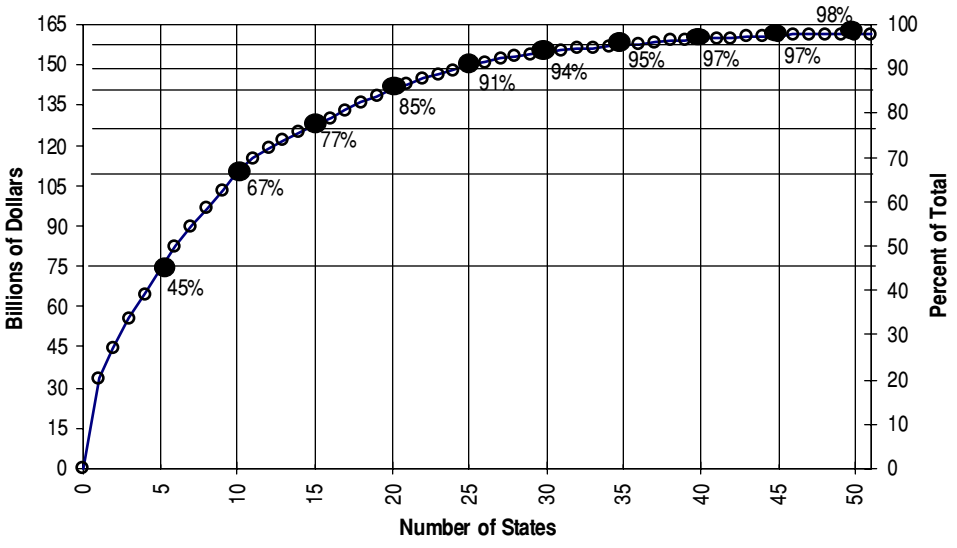
INTRODUCTION

Data from the National Science Foundation (NSF) detail the geographic distribution of the 1993 U.S. research and development (R&D) spending total ($165 billion). The data include R&D performance by industry, academia, and the Federal Government and the federally funded R&D activities of nonprofit institutions. Substantial state-specific information also is available on the Federal agency sources of R&D support and on the R&D-performing sectors that receive Federal funding. These and many more statistics have been compiled in a set of 51 State Science & Engineering Profiles (including one for the District of Columbia). A Profile also is included for Puerto Rico, although statistics on its total and industry R&D performance were not available.

STATE DISTRIBUTION OF R&D PERFORMANCE

Roughly one-half of the $165 billion of R&D spending in 1993 occurred in just six states (California, New York, Michigan, New Jersey, Massachusetts, and Pennsylvania) and 10 states (adding Texas, Illinois, Ohio, and Maryland) accounted for about two-thirds of the national effort (chart 1). In each of these 10 states, more than $6 billion was spent on R&D. Performance in California alone reached $34 billion, one-fifth of all U.S. funds. R&D performance in each of the next 10 states totaled more than $2 billion; when combined with the first 10 states, they collectively accounted for 85 percent of R&D conducted nationwide in 1993. In contrast, the 20 states with the smallest instate R&D performance collectively accounted for just $6 billion, 4 percent of nationally performed R&D (table 1).

Chart 1. Cumulative distribution of U.S. R&D performance, by State: 1993



NOTE: The District of Columbia is included here as a State. The cumulative sum reaches 97.8%, rather than 100%, due to R&D performance in the other/unknown category (unassignable to a State).

SOURCE: National Science Foundation/SRS, *National Patterns of R&D Resources: 1996*, NSF 96-333, (Arlington, VA, 1997).

Table 1. Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1993

Geographic area	United States Total used	Federal Govt. Total used 1/	Industry Sources			Universities & colleges Sources						U&C FFRDCs Total used 5/	Non-profits Total used 6/
			Total used 2/	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Nonfed. govt.	Industry	U&C	All other		
	Millions of Current Dollars												
Total, U.S.	165,048	16,663	117,400	22,809	94,388	19,940	11,956	1,559	1,361	3,578	1,486	5,295	5,750
New England	13,674	730	10,092	2,311	7,781	1,736	1,172	39	133	214	178	355	761
Connecticut	2,809	53	2,373	419	1,954	365	221	10	18	81	35	0	18
Maine	114	13	59	D	D	25	9	2	4	10	0	0	17
Massachusetts	9,486	384	6,952	1,878	5,074	1,094	772	15	98	80	128	355	701
New Hampshire	438	89	248	D	D	99	68	6	5	12	9	0	2
Rhode Island	484	185	176	12	164	103	72	3	3	23	2	0	20
Vermont	343	6	284	D	D	50	32	3	5	8	3	0	3
Middle Atlantic	28,434	994	23,693	2,912	20,781	2,938	1,896	132	225	446	238	445	364
New Jersey	9,181	509	8,162	378	7,784	374	167	36	26	116	28	116	20
New York	10,974	131	8,820	1,392	7,428	1,545	1,052	76	88	180	149	293	185
Pennsylvania	8,278	354	6,711	1,142	5,569	1,019	677	20	112	149	61	35	159
South Atlantic	22,994	8,034	10,692	3,078	7,614	3,605	2,224	307	281	643	166	63	600
Delaware	1,247	12	1,181	24	1,157	53	26	4	5	14	4	0	1
D.C	2,543	1,713	540	21	519	145	100	1	10	18	15	0	145
Florida	3,526	608	2,425	970	1,455	489	268	32	41	120	29	0	4
Georgia	1,577	159	860	63	797	547	273	39	52	168	15	0	11
Maryland	7,423	4,010	2,076	1,287	789	1,128	842	90	48	116	32	0	209
North Carolina	2,745	174	1,929	16	1,913	605	378	74	70	64	19	0	37
South Carolina	713	38	495	D	D	178	73	16	14	53	22	0	2
Virginia	2,941	1,227	1,087	595	492	405	228	46	36	69	26	35	187
West Virginia	280	93	100	D	D	55	32	2	4	14	3	28	4
Southeast	3,935	1,099	1,966	865	1,101	787	452	86	63	134	51	11	72
Alabama	1,967	833	833	406	427	281	161	27	24	48	21	0	20
Kentucky	429	16	289	7	282	122	56	6	14	41	6	0	2
Mississippi	325	163	52	D	D	106	55	22	10	11	8	0	4
Tennessee	1,214	87	792	D	D	278	180	31	16	34	16	11	46
Southwest	8,269	586	5,547	658	4,889	1,889	861	268	123	436	201	5	242
Arkansas	301	41	185	D	D	74	25	24	7	15	3	0	1
Louisiana	470	43	170	D	D	255	96	64	17	61	17	0	2
Oklahoma	533	34	311	2	309	173	56	22	10	67	16	0	15
Texas	6,966	468	4,882	640	4,242	1,387	683	158	90	293	164	5	224

See explanatory information, if any, and SOURCE at end of table.

Table 1. Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1993 - Continued

Geographic area	United States Total used	Federal Govt. Total used 1/	Industry Sources			Universities & colleges Sources						U&C FFRDCs Total used 5/	Non-profits Total used 6/
			Total used 2/	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Nonfed. govt.	Industry	U&C	All other		
	Millions of Current Dollars												
Great Lakes	28,364	877	23,830	1,642	22,188	2,798	1,573	220	181	559	264	649	210
Illinois	6,778	83	5,242	236	5,006	758	425	46	45	178	64	649	46
Indiana	2,560	77	2,177	D	D	303	168	21	23	66	26	0	3
Michigan	10,778	96	9,924	153	9,771	700	377	40	47	172	64	0	58
Ohio	6,398	583	5,144	1,030	4,114	594	348	46	48	89	62	0	77
Wisconsin	1,851	38	1,343	D	D	444	255	68	19	54	48	0	26
Plains	6,519	198	4,816	816	4,000	1,342	643	194	90	331	84	37	126
Iowa	902	30	533	D	D	299	145	38	18	81	17	37	3
Kansas	463	12	292	47	245	154	60	37	8	44	6	0	5
Minnesota	2,922	40	2,458	378	2,080	332	175	50	22	65	21	0	92
Missouri	1,789	51	1,375	D	D	345	191	19	31	78	25	0	18
Nebraska	295	25	128	14	114	136	38	40	9	36	13	0	6
North Dakota	91	27	9	D	D	54	25	2	2	24	2	0	1
South Dakota	58	13	22	D	D	22	9	10	1	2	1	0	1
Mountain	8,820	1,161	5,013	1,651	3,362	1,233	718	81	89	273	72	1,223	189
Arizona	1,608	206	1,042	298	744	311	150	6	19	113	23	40	9
Colorado	2,864	170	2,111	252	1,859	331	222	18	24	42	26	99	153
Idaho	477	37	391	D	D	49	17	13	7	11	1	0	0
Montana	85	22	14	D	D	48	21	9	3	14	0	0	1
Nevada	218	71	67	D	D	79	43	4	5	25	1	0	1
New Mexico	2,752	504	962	D	D	187	113	14	19	29	12	1,084	15
Utah	753	141	411	51	360	196	137	13	9	29	8	0	5
Wyoming	63	10	15	D	D	33	15	4	2	11	1	0	5

See explanatory information, if any, and SOURCE at end of table.

Table 1. Geographic distribution of U.S. R&D expenditures, by performer and source of funds: 1993 - Continued

Geographic area	United States Total used	Federal Govt. Total used 1/	Industry Sources			Universities & colleges Sources						U&C FFRDCs Total used 5/	Non-profits Total used 6/
			Total used 2/	Federal Govt.	Industry 3/	Total used 4/	Federal Govt.	Nonfed. govt.	Industry	U&C	All other		
			Millions of Current Dollars										
Pacific	40,427	2,039	31,971	8,393	23,578	3,174	2,160	186	146	475	207	2,499	744
Alaska	130	48	14	D	D	67	42	3	5	17	0	0	1
California	33,721	1,785	26,541	7,463	19,078	2,380	1,630	112	99	368	171	2,499	516
Hawaii	380	42	255	D	D	74	41	27	0	3	2	0	9
Oregon	774	51	471	32	439	226	135	30	9	34	18	0	26
Washington	5,422	113	4,689	891	3,798	428	312	14	34	52	16	0	192
Other/unknown7/	3,612	945	-220	483	-906	437	257	45	30	67	24	8	2,442

D = withheld to avoid disclosing operations of individual companies
FFRDC = federally funded research and development center
U&C = universities and colleges

1/ Total funds used by the Federal Government are from federal sources.
2/ Industry totals include R&D performed by industry-administered FFRDCs. Totals for the following States are more than 50 percent imputed: Delaware, D.C., Kansas, Louisiana, Missouri, Washington, and West Virginia. Totals for the following States were based entirely on estimates by NSF: Maine, Montana, New Mexico, and Vermont.
3/ Industry R&D support to industry performers include all nonfederal sources of funds.
4/ For universities and colleges, funds distributed by state and region are for doctorate-granting institutions only.
5/ Includes R&D expenditures of university-associated FFRDCs, of which 99 percent were from federal sources.
6/ For the nonprofit sector, funds distributed by state and region include only federal obligations to organizations in this sector, including associated FFRDCs. Estimated nonfederal support to the nonprofit sector is included in "other/unknown."
7/ Negative figures for industry reflect revisions in industry aggregate R&D totals that could not be allocated to individual states.

SOURCES: National Science Foundation/SRS. Data were derived from NSF/SRS, *Research and Development in Industry 1993*; NSF/SRS, *Academic Science/Engineering: R&D Expenditures, Fiscal Year 1994*; and NSF/SRS, *Federal Funds for Research and Development; Fiscal Years 1993, 1994, and 1995*.

Not coincidentally, states that are national leaders in total R&D performance usually are leading sites of industrial and academic R&D performance (table 2).

- All but Maryland ranked among the top 10 industrial performers-Washington State (ranking 11th for total R&D) held the 10th spot for industrial R&D.

- All but New Jersey ranked among the top 10 academic performers-North Carolina (ranking 18th overall) ranked ninth among the academic listings.

The top 10 sites for R&D performed in Federal labs include 5 of the 10 states ranked highest in total R&D. Washington, DC, and Virginia are listed among the Federal top 10, a fact that-along with the number one ranking for Maryland-reflects the concentration of Federal facilities and administrative offices within the Washington, DC, metropolitan area. Alabama, Florida, and New Mexico-with major space- and defense-related research activity-also were ranked among the Federal R&D top 10, but not among the 10 largest total R&D performers.

Table 2. R&D performance by state and sector and ratio of R&D to gross state product: 1993

Rank	Total R&D[1]	Largest 10 performers (ranked by size of R&D in sector)				R&D intensity	
		Total	Industry	Universities and colleges[2]	Federal Government[2]	Largest 10	R&D/ GSP
	[Millions of dollars]						[Percent]
1	$33,721	California	California	California	Maryland	New Mexico	8.1
2	10,974	New York	Michigan	New York	California	Maryland	6.2
3	10,778	Michigan	New York	Texas	DC	DC	6.1
4	9,486	Massachusetts	New Jersey	Maryland	Virginia	Massachusetts	5.7
5	9,181	New Jersey	Massachusetts	Massachusetts	Alabama	Michigan	5.1
6	8,278	Pennsylvania	Pennsylvania	Pennsylvania	Florida	Delaware	4.9
7	7,423	Maryland	Illinois	Illinois	Ohio	California	4.3
8	6,966	Texas	Ohio	Michigan	New Jersey	Washington	4.2
9	6,778	Illinois	Texas	North Carolina	New Mexico	New Jersey	4.0
10	6,398	Ohio	Washington	Ohio	Texas	Colorado	3.2

[1] Includes instate R&D performance of industry, universities, federally funded research and development centers (FFRDCs), and Federal agencies and the federally funded R&D performance of nonprofit institutions.

[2] Excludes R&D activities of FFRDCs located within these states.

KEY: GSP = gross state product

SOURCE: NSF/SRS, *National Patterns of R&D Resources: 1996*, NSF 96-333, (Arlington, VA, 1997).

RATIO OF R&D TO GROSS STATE PRODUCT

These state rankings change when R&D expenditures are normalized by the size of each state. Just as the ratio of R&D expenditures to GDP is used to gauge a country's commitment to R&D, the ratio of instate R&D performance to gross state product (GSP) measures the R&D intensity of a state's economy and facilitates more meaningful interstate comparisons. For example, whereas the U.S. R&D/GDP ratio was 2.6 percent in 1993, the largest R&D/GSP ratio was achieved in New Mexico (8.1 percent) even though the state ranked 17th in terms of total R&D spending. The high research intensity of New Mexico's economy grew primarily from the considerable Federal support provided by the Department of Energy to the several federally funded R&D centers (FFRDCs) located in the state.

On the other hand, California-ranked first each in total, industrial, and academic R&D spending-ranked seventh in terms of R&D intensity, 4.3 percent. Most small performers, however, have low R&D intensities. There were 19 states with less than $0.5 billion of R&D spending, and 14 of them had an R&D/GSP ratio of less than 1.0 percent.

FEDERAL SUPPORT FOR R&D

As reported by the Federal agencies that fund R&D, the Department of Defense (DOD) and the Department of Health and Human Services (HHS) collectively provided 69 percent of the Federal Government's R&D support in FY 1994 to all performers, including firms, universities, nonprofit institutions, and Federal labs. California and Maryland were the two largest recipients of total Federal R&D support (table 3). Performers-primarily industrial firms-in California received 19 percent of DOD's R&D support, and Maryland received 23 percent of HHS funding primarily in support of the intramural activities undertaken at its National Institutes of Health biomedical research facilities. California also received more of the R&D funds than any other state from the National Aeronautics and Space Administration (the main recipients being firms and FFRDCs) and the National Science Foundation (support going to universities and colleges). Maryland led all other states in receiving 34 percent of R&D funds from the Department of Commerce (DOC). Again, intramural research activities accounted for most of Maryland's DOC funding, here undertaken mostly at the agency's National Institute of Standards and Technology.

TECHNICAL NOTE:

Differences in performer-and source-reported Federal R&D

The National Science Foundation collects, and these Profiles contain, two separate estimates on total Federal funding of R&D. Survey data are obtained from both Federal funding agencies and performers of the work (Federal labs, industry, universities, and other nonprofit organizations). National totals, however, are

Table 3. Federal R&D obligations, by agency and state: FY 1994

Agency	Total R&D [Millions of dollars]	Primary recipient	Percent	Secondary recipient	Percent
Total, all agencies	65,654	California	17	Maryland	10
Department of Agriculture	1,378	Dist. of Columbia	12	Maryland	8
Department of Commerce	824	Maryland	34	Colorado	10
Department of Defense	34,433	California	19	Georgia	15
Department of Energy	6,038	New Mexico	20	California	17
Dept. of Health & Human Services	10,947	Maryland	23	California	11
Department of the Interior	587	Virginia	10	Colorado	9
Department of Transportation	618	Dist. of Columbia	22	New Jersey	14
Environmental Protection Agency	551	Dist. of Columbia	28	No. Carolina	21
National Aeronautics & Space Admin	8,255	California	24	Texas	19
National Science Foundation	2,021	California	14	New York	10

SOURCE: NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996, volume 44* , NSF 97-302 (Arlington, VA, 1996).

based on data reported by performers because they are in the best position to (i) indicate how much they spent in the actual conduct of R&D in a given year and (ii) identify the source of their funds. Performer reporting also reduces the possibility of double-counting and conforms to international standards and guidance.

Historically, the two survey systems of funders and performers tracked fairly closely. For example, in 1980 performers reported using $29.5 billion in Federal R&D funding and Federal agencies' reported total R&D obligations of $29.8 billion. In recent years, the two series have diverged considerably: For 1993, performers report $60.3 billion in Federal R&D support, compared with the $67.3 billion reported by Federal agencies (table 4). The difference in the Federal R&D data totals appear to be concentrated in funding of industry: Overall, industrial firms have reported significant declines in Federal R&D support since 1990 while Federal agencies reported level or slightly increased funding of industrial R&D. For 1993, Federal agencies reported $31.8 billion in total R&D obligations provided to industrial performers compared with an estimated $22.8 billion in Federal R&D funding reported by industrial performers (table 5). Consequently, data users are cautioned to use considerable care in comparing the R&D performance data in table 2 (and detailed in the upper half of the Profiles) with that reported by Federal agencies in table 3 (and detailed in the lower half of the Profiles). NSF is investigating causal factors for these divergent trends.

Table 4. Difference in agency-reported and performer-reported Federal R&D, all performers: 1980-96

Year	Reported by Federal Agencies			Performer-reported Expenditures
	Authorizations	Obligations	Outlays	
	[millions of current dollars]			
1980	29,739	29,830	29,154	29,455
1981	33,735	33,104	32,459	33,415
1982	36,115	36,433	34,391	36,583
1983	38,768	38,712	36,659	40,838
1984	44,214	42,225	39,691	45,649
1985	49,887	48,360	44,171	52,128
1986	53,249	51,412	50,609	54,283
1987	57,069	55,254	51,612	57,914
1988	59,106	56,769	54,739	59,382
1989	62,115	61,406	59,450	59,799
1990	63,781	63,559	62,135	61,342
1991	65,898	61,295	61,130	60,120
1992	68,398	65,593	62,935	60,192
1993	69,884	67,314	65,241	60,323
1994	68,331	67,256	66,159	60,234
1995 (preliminary)	70,309	70,094	67,400	62,500
1996 (preliminary)	70,503	68,842	67,653	61,900

SOURCES: NSF/SRS, Survey of Federal Funds for Research and Development; Survey of Industrial Research and Development; Survey of Scientific & Engineering Expenditures at Universities and Colleges; and Office of Management and Budget, *Historical Tables, Budget of the United States Government-Fiscal Year 1997* (1996)

Table 5. Difference in agency-reported and performer-reported Federal R&D: industrial performers by agency source, 1980-96

Year	Industry Survey			Federal Survey			Difference in Report Totals		
	Total	Department of Defense	Other agencies	Total	Department of Defense	Other agencies	Total	Department of Defense	Other agencies
	[millions of current dollars]								
1980	14,029			14,377			-348		
1981	16,382	10,540	5,842	16,282	10,931	5,351	100	-391	491
1982	18,545			18,698			-153		
1983	20,680	14,571	6,109	18,522	14,670	3,852	2,158	-99	2,257
1984	23,396			20,218			3,178		
1985	27,196	20,948	6,248	23,496	19,069	4,427	3,700	1,879	1,821
1986	27,891			25,898			1,993		
1987	30,757	22,252	8,505	28,629	24,258	4,371	2,128	-2,006	4,134
1988	30,343			28,630			1,713		
1989	28,554	NA	NA	30,603	25,043	5,560	-2,049	NA	NA
1990	28,125			31,696			-3,571		
1991	26,372	NA	NA	28,589	21,349	7,240	-2,217	NA	NA
1992	24,722			31,862			-7,140		
1993	22,809	15,044	7,765	31,777	23,856	7,921	-8,968	-8,812	-156
1994	22,463			31,748			-9,285		

KEY: NA=not available

NOTES: Data from the Industry Survey are R&D expenditures as reported by performing firms. Data from the Federal Survey are R&D obligations to industry as reported by Federal agencies. The last three columns report the difference between the two data series.

SOURCES: NSF/SRS, Survey of Federal Funds for Research and Development and Survey of Industrial Research and Development